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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/911,083	07/24/2001	Duck Chul Hwang	1567.1016	2905

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EXAMINER

RUTHKOSKY, MARK

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 07/15/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

15-6

Office Action Summary

Application No.

09/911,083

Applicant(s)

HWANG ET AL.

Examiner

Mark Ruthkosky

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 July 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 July 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

The information disclosure statement filed 7/24/2001 has been placed in the application file, and the information referred to therein has been considered as to the merits.

Drawings

The drawings filed on 7/24/2001 have been approved.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The term "high" in "high dielectric constant" and "high viscosity" (for example, in claim 1) are relative terms, which renders the claim indefinite. The terms are not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

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Although examples of solvents are noted, the specification does not provide a degree or limitation as to what defines high in each case. As it is not clear what defines a "high dielectric constant" and "high viscosity," the claims are held indefinite.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 3, 5-7, 11, 13-17, 19, 20-23, 26-28, 30-33 are rejected under 35 U.S.C. 102(b) as being anticipated by Griffin et al. (US 5,552,244.)

The instant claims are to an electrolyte for a lithium sulfur battery having a positive and negative electrode comprising a first solvent component with a sulfur solubility greater than 20 mM; a second solvent component with a sulfur solubility less than 20 mM; a third solvent component with a high dielectric constant and a high viscosity and an electrolyte salt.

Griffin et al. (US 5,552,244) teaches an electrolyte for a lithium sulfur battery having a positive and negative electrode comprising a first solvent component with a sulfur solubility greater than 20 mM; a second solvent component with a sulfur solubility less than 20 mM; a third solvent component with a high dielectric constant and a high viscosity and an electrolyte

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salt (see claim 5 for example.) Tetrahydrofuran, ethanol, propylene carbonate and mixtures thereof are noted. Tetrahydrofuran is shown in the specification as a first solvent component with a sulfur solubility greater than 20 mM. Ethanol is shown in the specification as a second solvent component with a sulfur solubility less than 20 mM. Propylene carbonate is shown in the specification as a third solvent component with a high dielectric constant and a high viscosity. Metal salts are noted at the top of column 4 (col. 3, line 45-col. 4, line 15.) It is further noted that a mixture of water, ethanol and propylene is noted at the top of column 5. Thus, the claims are anticipated.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Griffin et al. (US 5,552,244) as applied above, and further in view of Omaru (US 5,437,945.)

Griffin et al. (US 5,552,244) teaches a an electrolyte for a lithium sulfur battery having a positive and negative electrode comprising a first solvent component with a sulfur solubility greater than 20 mM; a second solvent component with a sulfur solubility less than 20 mM; a third solvent component with a high dielectric constant and a high viscosity and an electrolyte salt (see claim 5 for example.) Tetrahydrofuran, ethanol, propylene carbonate and mixtures thereof are noted. Tetrahydrofuran is shown in the specification as a first solvent component

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with a sulfur solubility greater than 20 mM. Ethanol is shown in the specification as a second solvent component with a sulfur solubility less than 20 mM. Propylene carbonate is shown in the specification as a third solvent component with a high dielectric constant and a high viscosity. Metal salts are noted at the top of column 4 (col. 3, line 45-col. 4, line 15.)

With regard to claim 4, the reference does not teach the limitation that components 2 and 3 are added in a 1:1 ratio. With regard to claim 12, the reference does not teach the limitation that the electrolyte is added in a concentration of 0.5-2.0 M. Omaru (US 5,437,945) teaches an electrolyte for a secondary battery which is made of two solvent components which correspond to the second solvent component with a sulfur solubility less than 20 mM (DMC and DEC are noted as examples in col. 3 and col. 6) and the third solvent component (such as EC and PC) with a high dielectric constant and a high viscosity and an electrolyte salt (see claim 5 for example.) The electrolyte further includes a lithium salt as noted in the present invention that is included in a concentration of about 0.6 to 1.8 mol/L. In example 1, the mixed solvent is added in a 1:1 ratio and the concentration is 1mol/L. It is further noted that other solvents may be mixed with or substituted in the electrolyte including THF and Me-THF. It would be obvious to one of ordinary skill in the art at the time the invention was made to add solvent components 2 and 3 are added in a 1:1 ratio and the electrolyte in a concentration of 0.5-2.0 M. The mixture of solvents provides an electrolyte with a high dielectric constant and a low viscosity which will provide a high energy density and long service life over a broad range of working temperatures (see col. 3, lines 1-35.) The concentration range of the electrolyte provides for an electrical conductance sufficient to allow for good charging/discharging efficiency as taught by Omaru, (see col. 6, lines 20-55.)

The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

Allowable Subject Matter

Claims 2, 8-10, 18, 24-25 and 29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 2, 18 and 29 show specific concentrations of each component in the solvent mixture. The prior art does not teach the components in specific amounts. For example, tetrahydrofuran, ethanol, propylene carbonate and mixtures thereof are noted in Griffin et al. (US 5,552,244,) however, no specific mixtures of the three components or proportions of each element are taught.

With regard to claims 8-10 and 24-25, the reference does not teach an additional additive to the electrolyte, which will form a solid electrolyte interface at the surface of the anode. As such, the claims contain allowable subject matter.

Examiner Correspondence

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1193. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 703-305-0587. The examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:00.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be

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reached at 703-308-2383. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Mark Ruthkosky

Patent Examiner

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Mark Ruthkosky
7/9/03